☐ Tentative Specification
☐ Preliminary Specification
■ Approval Specification

# MODEL NO.: V320BJ6
# SUFFIX: PE1

**Customer:**

**APPROVED BY** **SIGNATURE**

Name / Title _____ _____

**Note**

Please return 1 copy for your confirmation with your signature and comments.

| Approved By | Checked By | Prepared By |
|---|---|---|
| Chao-Chun Chung | Vincent Chou | Andy Chen |

# CONTENTS

REVISION HISTORY ..... 4

1. GENERAL DESCRIPTION ..... 5
   1.1 OVERVIEW ..... 5
   1.2 FEATURES ..... 5
   1.3 MECHANICAL SPECIFICATIONS ..... 5

2. ABSOLUTE MAXIMUM RATINGS ..... 6
   2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMI MODULE V315B5-LE3) ..... 6
   2.3 ELECTRICAL ABSOLUTE RATINGS ..... 7
   2.3.1 TFT LCD MODULE ..... 7

3. ELECTRICAL CHARACTERISTICS ..... 8
   3.1 TFT LCD MODULE ..... 8

4. BLOCK DIAGRAM OF INTERFACE ..... 11
   4.1 TFT LCD MODULE ..... 11

5. INPUT TERMINAL PIN ASSIGNMENT ..... 12
   5.1 TFT LCD Module Input ..... 12
   5.2 BLOCK DIAGRAM OF INTERFACE ..... 14
   5.3 LVDS INTERFACE ..... 15
   5.4 COLOR DATA INPUT ASSIGNMENT ..... 16

6. INTERFACE TIMING ..... 18
   6.1 INPUT SIGNAL TIMING SPECIFICATIONS ..... 18

7. OPTICAL CHARACTERISTICS ..... 22
   7.1 TEST CONDITIONS ..... 22

8. DEFINITION OF LABELS ..... 25
   8.1 OPEN CELL LABEL ..... 25

9. PACKAGING ..... 26

9.1 PACKAGING SPECIFICATIONS .....26
9.2 PACKAGING METHOD .....26

10. PRECAUTIONS .....28

11. MECHANICAL CHARACTERISTIC .....29

## REVISION HISTORY

| Version | Date | Page (New) | Section | Description |
|---|---|---|---|---|
| Ver. 1.0 | Jan. 16, 2012 | All | All | Preliminary Specification was first issued. |
| Ver. 2.0 | Mar. 19, 2012 | All | All | Approval Specification was first issued. |

# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

V320BJ6-PE1 is a 32" TFT Liquid Crystal Display product. This product supports 1366 x 768 WXGA format and can display true 16.7M (8-bit/color) colors.

## 1.2 FEATURES

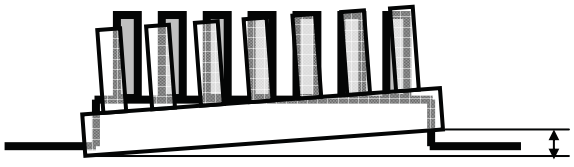
| CHARACTERISTICS ITEMS | SPECIFICATIONS |
|---|---|
| Screen Diagonal [in] | 31.5 |
| Pixels [lines] | 1366 x 768 |
| Active Area [mm] | 697.6845 (H) x 392.256 (V) (31.5" diagonal) |
| Sub-Pixel Pitch [mm] | 0.17025 (H) x 0.51075 (V) |
| Pixel Arrangement | RGB vertical stripe |
| Weight [g] | 880 |
| Physical Size [mm] | 716.1(W) × 410.0(H) × 1.35(D) Typ. |
| Display Mode | Transmissive mode / Normallly black |
| Contrast Ratio | 3000:1 Typ.<br>(Typical value measure at CMI's module) |
| Glass thickness (Array / CF) [mm] | 0.5 / 0.5 |
| Viewing Angle (CR>20) | +88/-88(H), +88/-88(V) Typ. (CR≧20)<br>(Typical value measure at CMI's module) |
| Color Chromaticity | TBD<br>* Please refer to "color chromaticity" on p.22 |
| Cell Transparency [%] | 6.0%<br>(Typical value measured at CMI's module) |
| Polarizer Surface Treatment | Anti-Glare coating (Haze 1%), Hard coating (3H) |

## 1.3 MECHANICAL SPECIFICATIONS

| Item | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Weight | | 880 | | g | - |
| I/F connector mounting position | The mounting inclination of the connector makes the screen center within ± 0.5mm as the horizontal. | | | | (2) |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Connector mounting position



+/- 0.5mm

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMI MODULE V315B5-LE3)

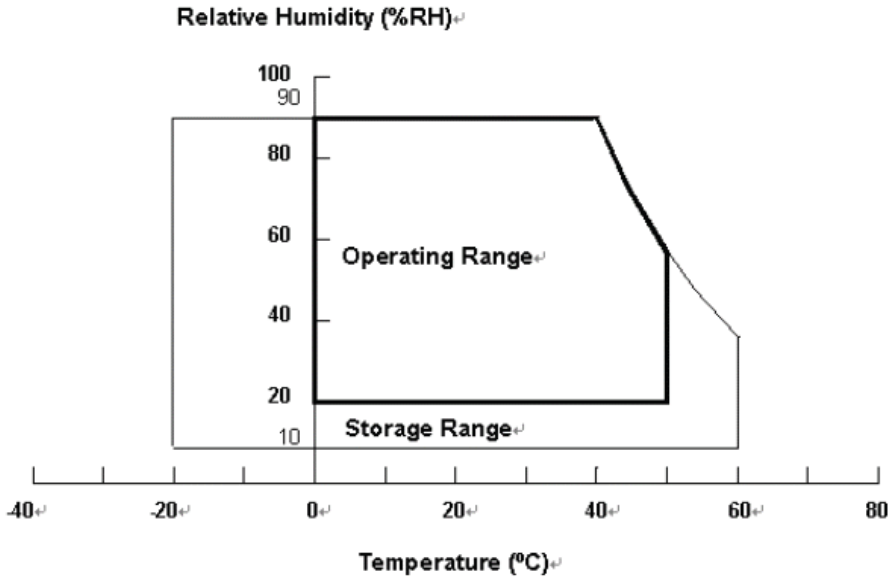
| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -20 | +60 | ºC | (1), (3) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | 50 | ºC | (1), (2), (3) |

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.




Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) The rating of environment is base on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.

## 2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

Storage Condition: With shipping package.

Storage temperature range: 25±5 ℃

Storage humidity range: 50±10%RH

Shelf life: a month

## 2.3 ELECTRICAL ABSOLUTE RATINGS

### 2.3.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power Supply Voltage | VCC | -0.3 | 13.5 | V | (1) |
| Input Signal Voltage | VIN | -0.3 | 3.6 | V | |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

## 3. ELECTRICAL CHARACTERISTICS

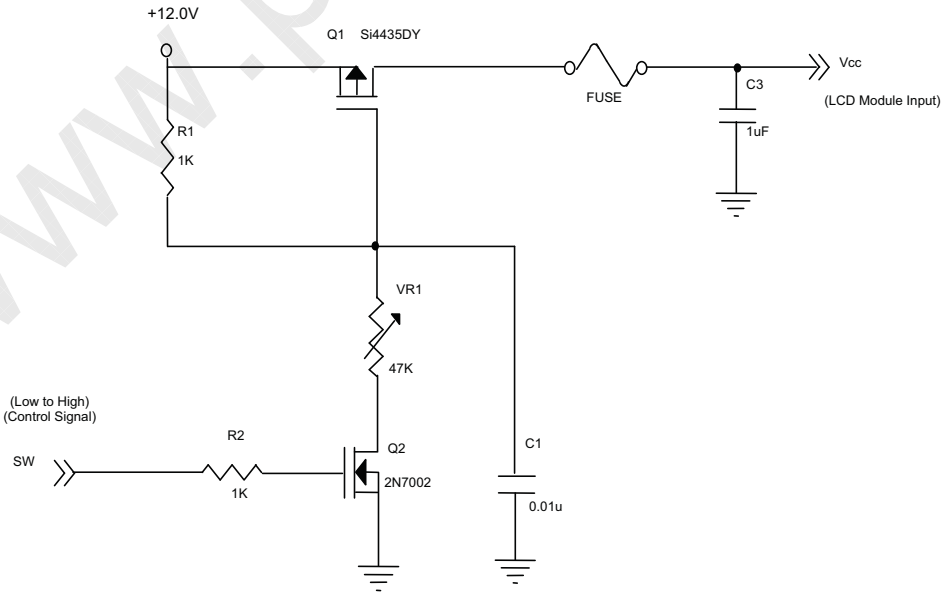
### 3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

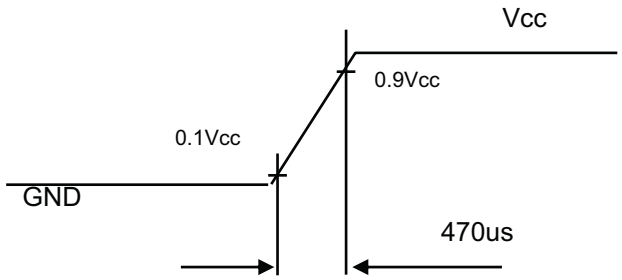
| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{CC}$ | 10.8 | 12 | 13.2 | V | (1) |
| Rush Current | | $I_{RUSH}$ | — | — | 2.50 | A | (2) |
| Power Supply Current | White Pattern | — | — | 0.31 | 0.36 | A | (3) |
| | Horizontal Stripe | — | — | 0.47 | 0.57 | A | |
| | Black Pattern | — | — | 0.29 | 0.35 | A | |
| LVDS interface | Differential Input High Threshold Voltage | $V_{LVTH}$ | +100 | — | — | mV | (4) |
| | Differential Input Low Threshold Voltage | $V_{LVTL}$ | — | — | -100 | mV | |
| | Common Input Voltage | $V_{CM}$ | 1.0 | 1.2 | 1.4 | V | |
| | Differential input voltage | $\|V_{ID}\|$ | 200 | — | 600 | mV | |
| | Terminating Resistor | $R_T$ | — | 100 | — | ohm | |
| CMOS interface | Input High Threshold Voltage | $V_{IH}$ | 2.7 | — | 3.3 | V | |
| | Input Low Threshold Voltage | $V_{IL}$ | 0 | — | 0.7 | V | |

Note (1) The module should be always operated within the above ranges.

Note (2) Measurement condition:



**Vcc rising time is 470us**



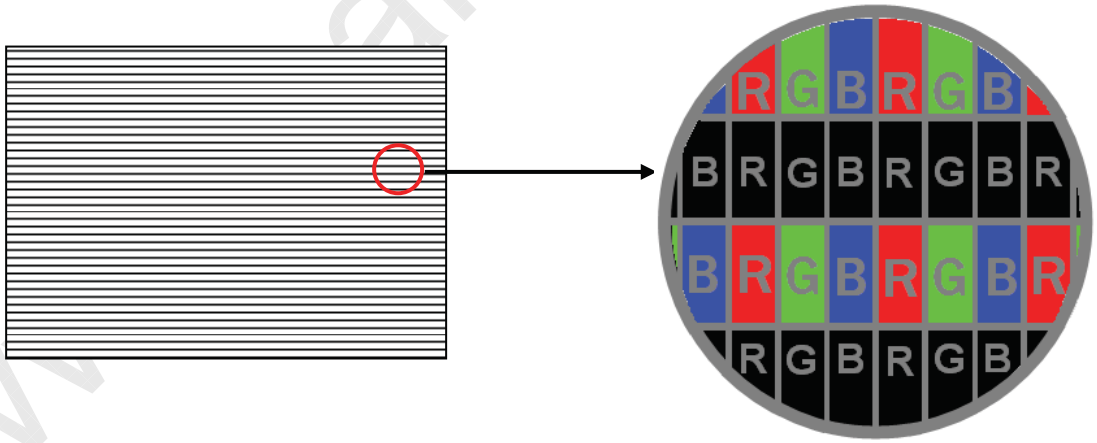

Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

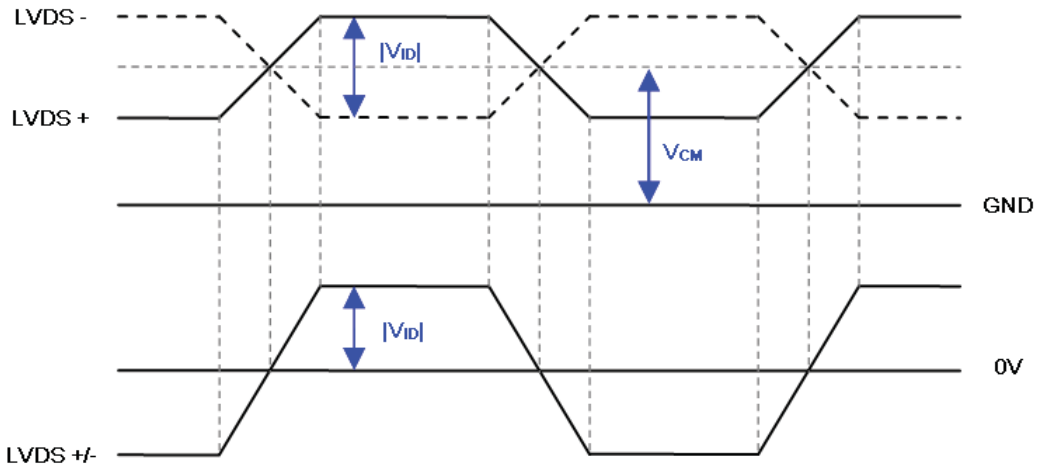
Active Area

b. Black Pattern

Active Area

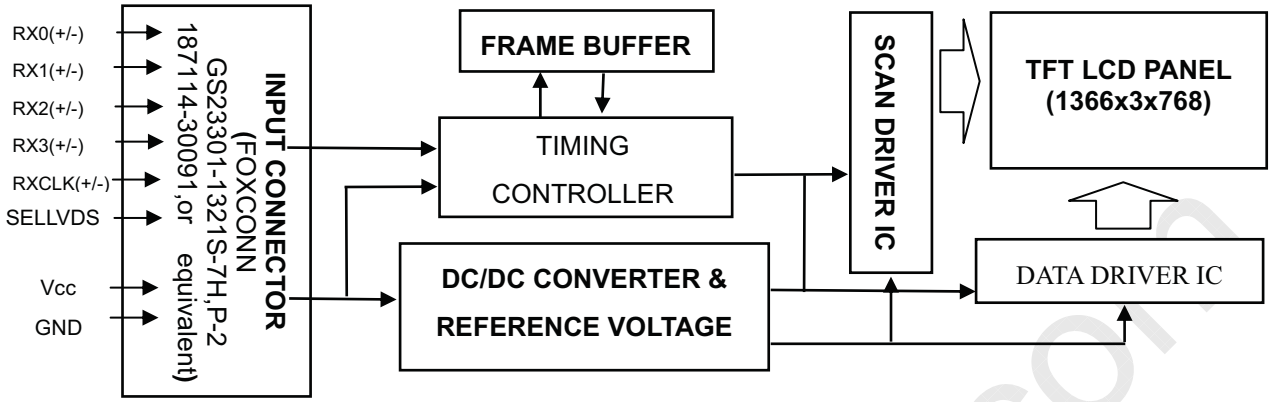


Note (4) The LVDS input characteristics are as follows:



## 4. BLOCK DIAGRAM OF INTERFACE

### 4.1 TFT LCD MODULE



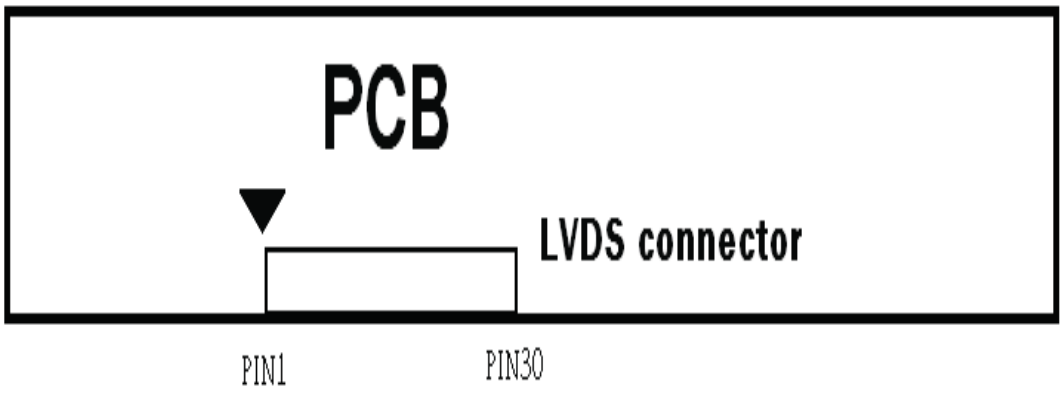
## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD Module Input

**CNF1 Connector Pin Assignment**

| Pin No. | Symbol | Description | Note |
|---|---|---|---|
| 1 | VCC | Power supply: +12V | |
| 2 | VCC | Power supply: +12V | |
| 3 | VCC | Power supply: +12V | |
| 4 | VCC | Power supply: +12V | |
| 5 | GND | Ground | |
| 6 | GND | Ground | |
| 7 | GND | Ground | |
| 8 | WP | EEPROM Write Protection (for auto Vcom)<br>(0V~0.7V/Open→Disable, 2.7V~3.3V→Enable) | |
| 9 | SELLVDS | Select LVDS data format | (2),(4) |
| 10 | NC | No connection | (3) |
| 11 | GND | Ground | |
| 12 | RX0- | Negative transmission data of pixel 0 | |
| 13 | RX0+ | Positive transmission data of pixel 0 | |
| 14 | GND | Ground | |
| 15 | RX1- | Negative transmission data of pixel 1 | |
| 16 | RX1+ | Positive transmission data of pixel 1 | |
| 17 | GND | Ground | |
| 18 | RX2- | Negative transmission data of pixel 2 | |
| 19 | RX2+ | Positive transmission data of pixel 2 | |
| 20 | GND | Ground | |
| 21 | RXCLK- | Negative of clock | |
| 22 | RXCLK+ | Positive of clock | |
| 23 | GND | Ground | |
| 24 | RX3- | Negative transmission data of pixel 3 | |
| 25 | RX3+ | Positive transmission data of pixel 3 | |
| 26 | GND | Ground | |
| 27 | NC | No connection | (3) |
| 28 | SCL | Serial clock input (for auto Vcom) | |
| 29 | SDA | Serial data input (for auto Vcom) | |
| 30 | GND | Ground | |

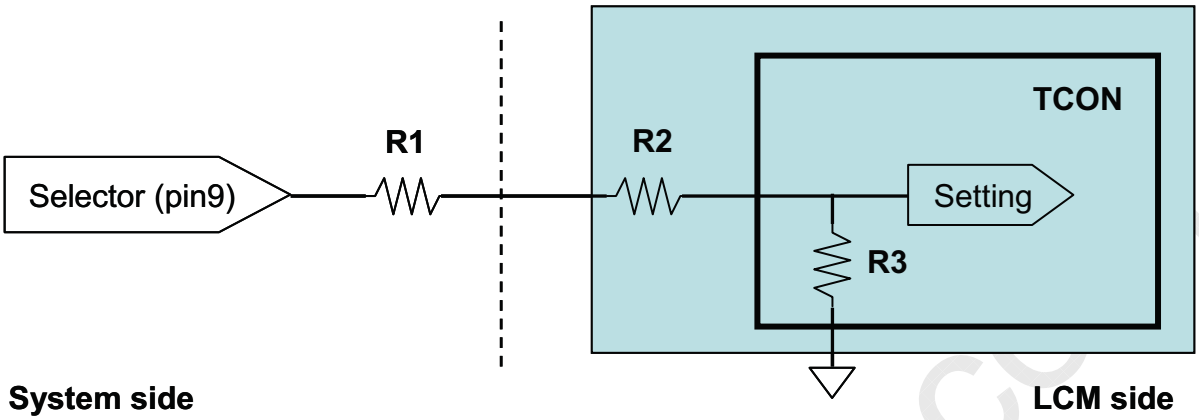
Note (1) LVDS connector pin orderdefined as follows



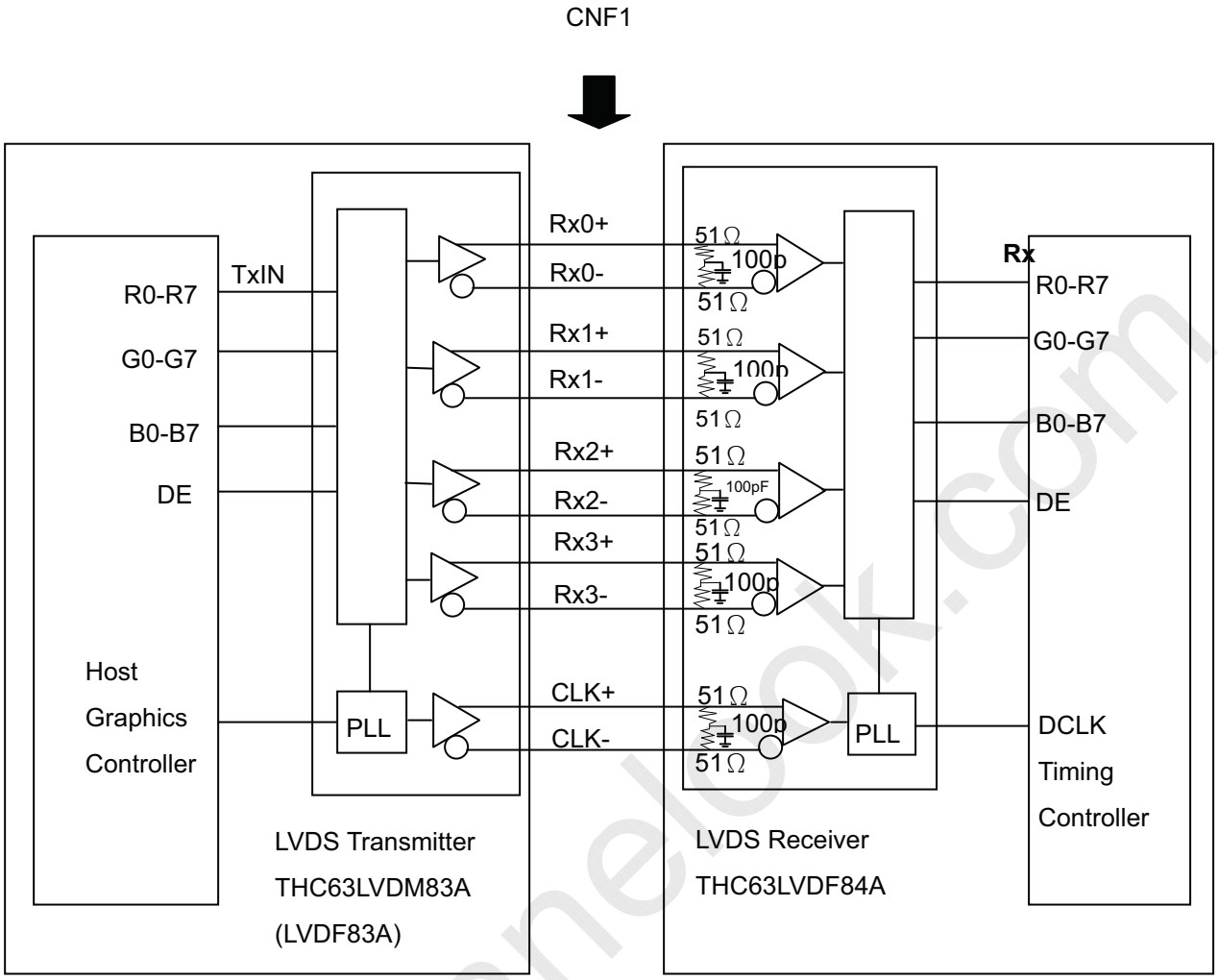

Note (2) Low = Open or connect to GND: VESA Format, High = Connect to +3.3V: JEIDA Format.

Note (3) Reserved for internal use. Please leave it open.

Note (4) LVDS signal pin connected to the LCM side has the following diagram. R1 in the system side should be less than 1K Ohm. (R1 < 1K Ohm)



### 5.2 BLOCK DIAGRAM OF INTERFACE

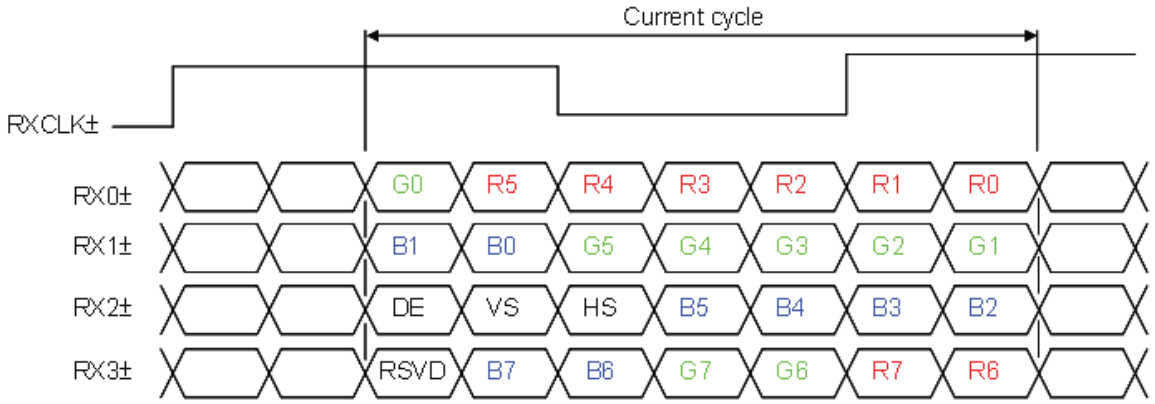



R0~R7 : Pixel R Data
G0~G7 : Pixel G Data
B0~B7 : Pixel B Data
DE : Data Enable Signal
DCLK : Data clock signal

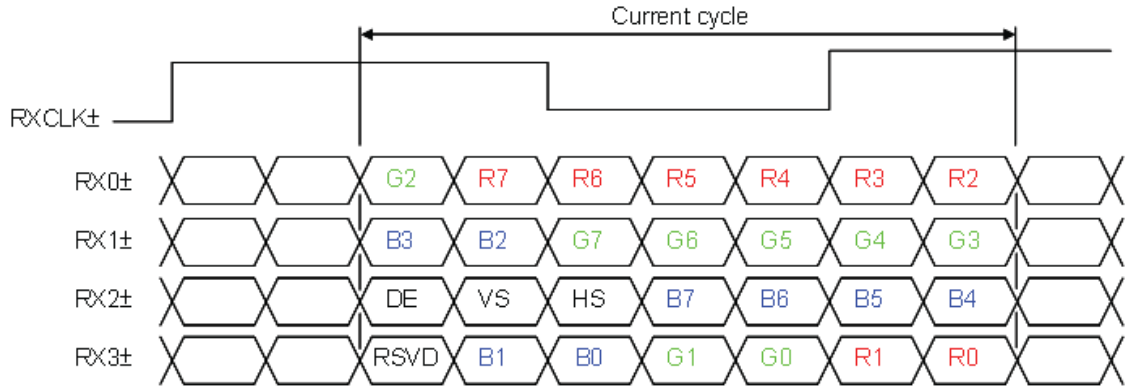
Note (1) The system must have the transmitter to drive the module.
Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

### 5.3 LVDS INTERFACE

VESA LVDS format：(SELLVDS pin=L or open)




JEIDA LVDS format：(SELLVDS pin=H)




R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE: Data enable signal

Notes (1) RSVD(reserved)pins on the transmitter shall be “H” or( “L” or OPEN)

### 5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

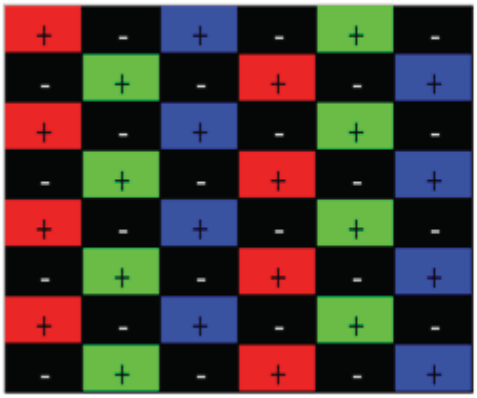
| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(253) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | Green(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | Blue(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

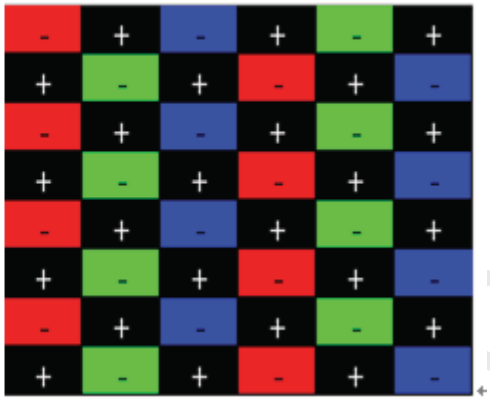
### 5.5 FLICKER (Vcom) ADJUSTMENT

(1) **Sub-pixel on/off pattern**

Frame N



Frame N+1



Gray level = 128

(2) Adjustment method: (Digital V-com)

Programmable memory IC is used for Digital V-com adjustment in this model. CMI provide Auto Vcom tools to adjust Digital V-com.The detail connection and setting instruction, please directly contact with Account FAE or refer CMI Auto V-com adjustment OI. Below items is suggested to be ready before Digital V-com adjustment in customer LCM line.

a. USB Sensor Board

b. Programmable software

## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(Ta = 25 ± 2 ºC)

The input signal timing specifications are shown as the following table and timing diagram.

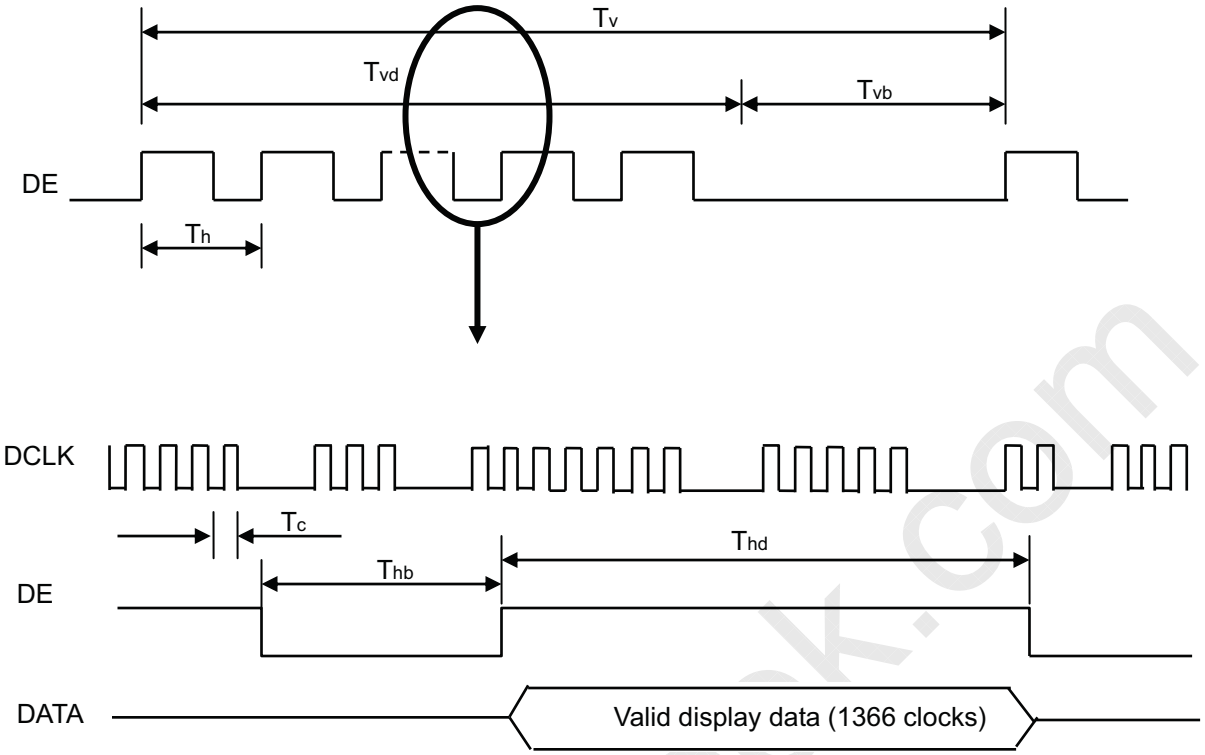
| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Receiver Clock | Frequency | $F_{clkin}$ (=1/TC) | 60 | 76 | 82 | MHz | |
| | Input cycle to cycle jitter | $T_{rcl}$ | — | — | 200 | ps | (3) |
| | Spread spectrum modulation range | $F_{clkin\_mod}$ | $F_{clkin}$-2% | — | $F_{clkin}$+2% | MHz | (4) |
| | Spread spectrum modulation frequency | $F_{SSM}$ | | | 200 | KHz | |
| LVDS Receiver Data | Receiver Skew Margin | $T_{RSKM}$ | -400 | — | 400 | ps | (5) |
| Vertical Active Display Term | Frame Rate | $F_{r5}$ | 47 | 50 | 53 | Hz | |
| | | $F_{r6}$ | 57 | 60 | 63 | Hz | |
| | Total | Tv | 776 | 806 | 1018 | Th | Tv=Tvd+Tvb |
| | Display | Tvd | 768 | 768 | 768 | Th | — |
| | Blank | Tvb | 8 | 38 | 250 | Th | — |
| Horizontal Active Display Term | Total | Th | 1442 | 1560 | 2006 | Tc | Th=Thd+Thb |
| | Display | Thd | 1366 | 1366 | 1366 | Tc | — |
| | Blank | Thb | 76 | 194 | 640 | Tc | — |

Note (1) Please make sure the range of pixel clock has follow the below equation：

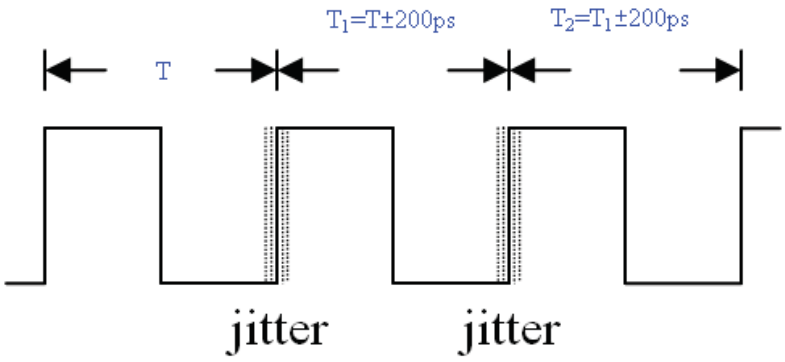
Fclkin(max) ≧ Fr6 × Tv × Th

Fr5 × Tv × Th ≧ Fclkin(min)

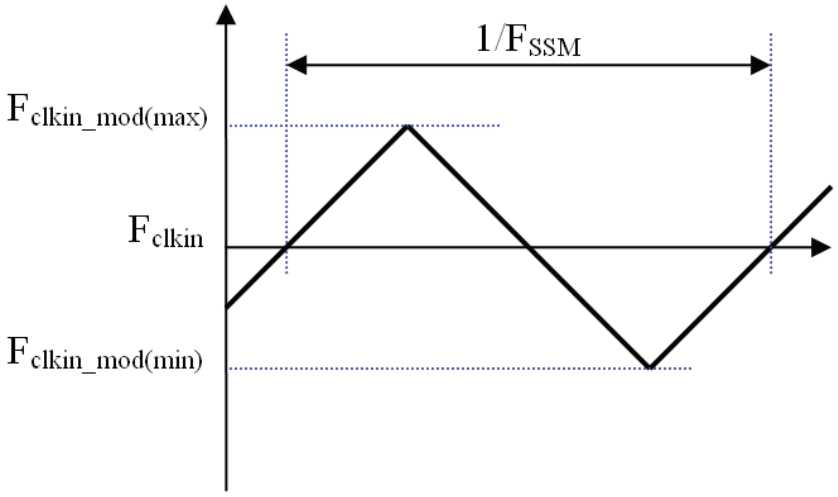
Note (2) This module is operated in DE only mode and please follow the input signal timing diagram below：




Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I $T_1$ – TI

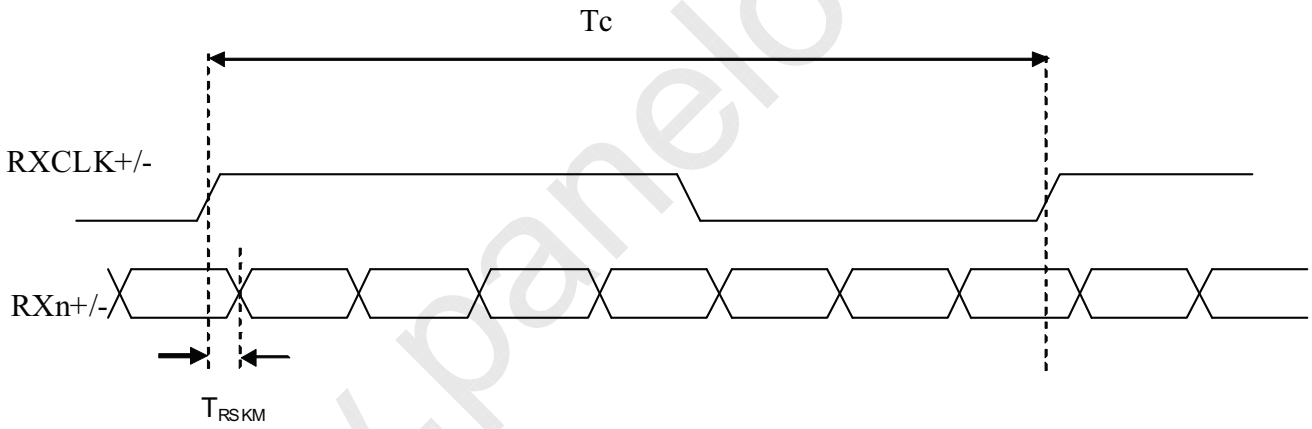


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.




Note (5) LVDS receiver skew margin is defined and showing as the following figures.

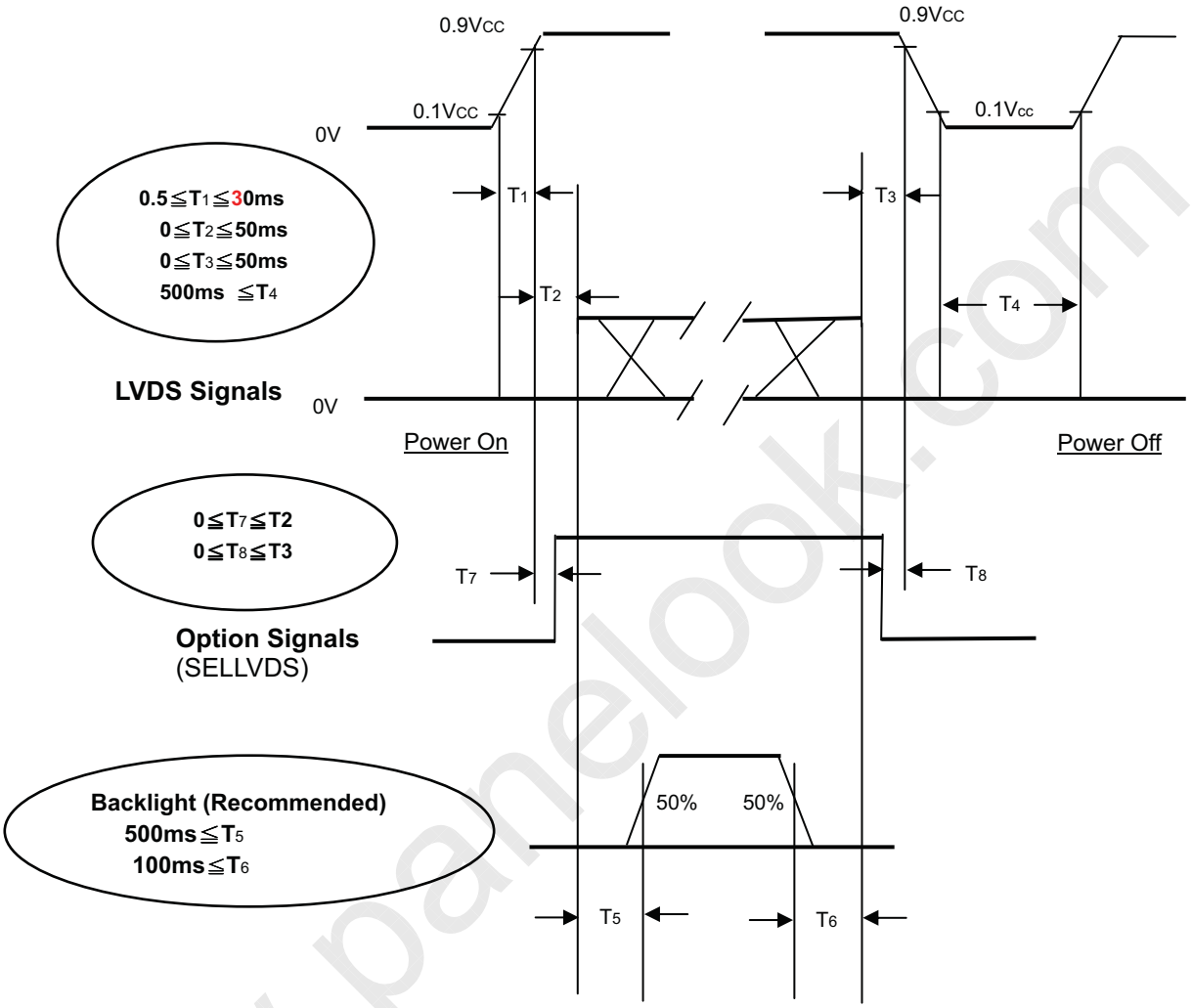
**LVDS RECEIVER INTERFACE TIMING DIAGRAM**



## 6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ºC)

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.




**Power ON/OFF Sequence**

Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the LED voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If T2<0,that maybe cause electrical overstress failure.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | °C |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | $V_{CC}$ | 12.0 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| LED Current | $I_L$ | 130 | mA |

### 7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

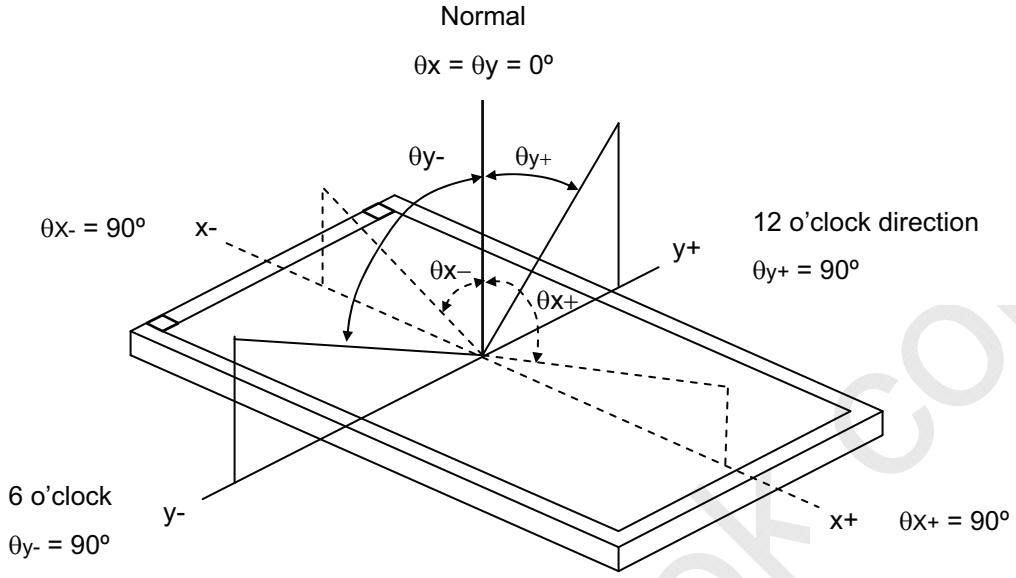
| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Color Chromaticity | Red | Rx | $\theta_x$=0°, $\theta_Y$ =0° Viewing angle at normal direction With C source | Typ.-0.03 | 0.657 | Typ+0.03 | - | (1),(5) |
| | | Ry | | | 0.329 | | - | |
| | Green | Gx | | | 0.277 | | - | |
| | | Gy | | | 0.596 | | - | |
| | Blue | Bx | | | 0.133 | | - | |
| | | By | | | 0.111 | | - | |
| | White | Wx | | | 0.308 | | - | |
| | | Wy | | | 0.347 | | - | |
| Center Transmittance | | T% | $\theta_x$=0°, $\theta_Y$ =0° With CMI Module | - | 6.0 | - | % | (1), (7) |
| Contrast Ratio | | CR | | 2000 | 3000 | - | - | (1), (3) |
| Response Time | | Gray to gray average | $\theta_x$=0°, $\theta_Y$ =0° With CMI Module@60Hz | - | 8.5 | - | ms | (4) |
| White Variation | | δW | $\theta_x$=0°, $\theta_Y$ =0° With CMI Module | - | - | 1.3 | - | (1), (6) |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≥20 With CMI Module | - | 88 | - | Deg. | (1), (2) |
| | | $\theta_x$- | | - | 88 | - | | |
| | Vertical | $\theta_Y$+ | | - | 88 | - | | |
| | | $\theta_Y$- | | - | 88 | - | | |

Note (1) Light source is the standard light source "C" which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following:

1. Measure Module's and BLU's spectrums. W, R, G, B are with signal input. BLU(for V315B5-LE3) is supplied by CMI.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C"

Note (2) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Autronic Conoscope Cono-80




Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

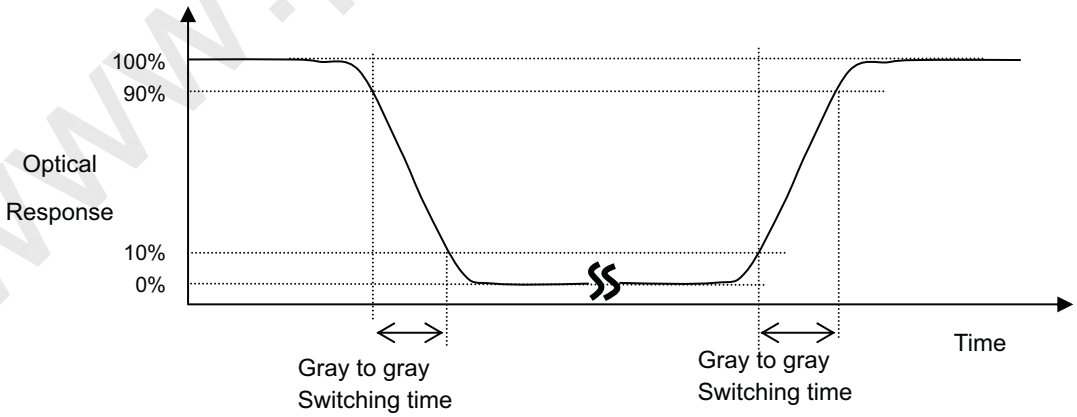
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (4) Definition of Gray-to-Gray Switching Time:

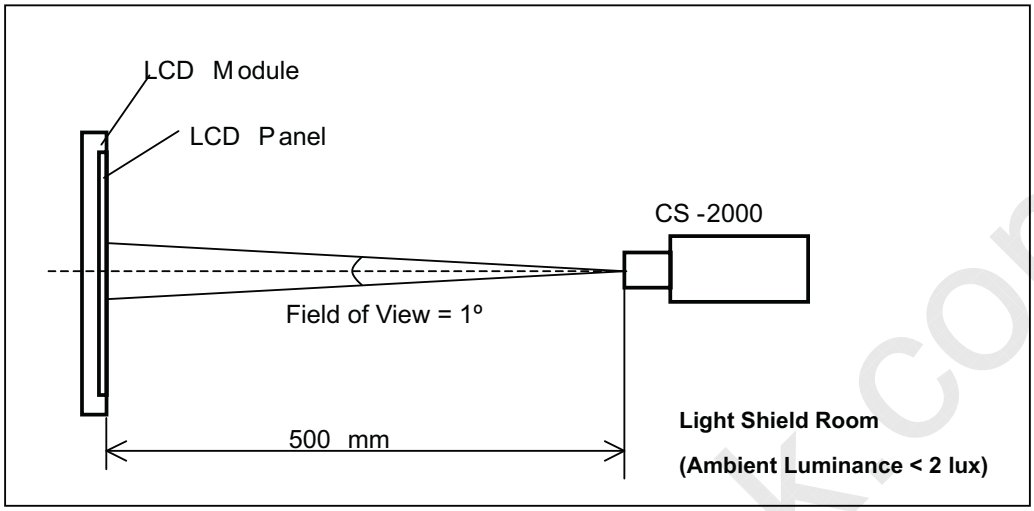



The driving signal means the signal of luminance 0%, 20%, 40%, 60%, 80%, 100%.

Gray to gray average time means the average switching time of luminance 0%, 20%, 40%, 60%, 80%, 100% to each other.

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 60 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 60 minutes in a windless room.

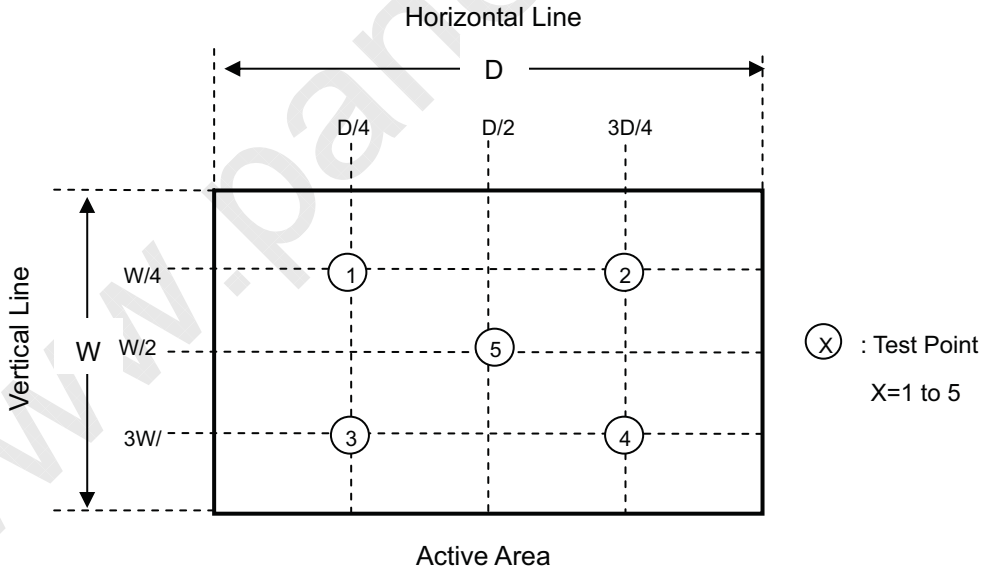



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

where L (X) is corresponding to the luminance of the point X at the figure below.




Note (7) Definition of Transmittance (T%):

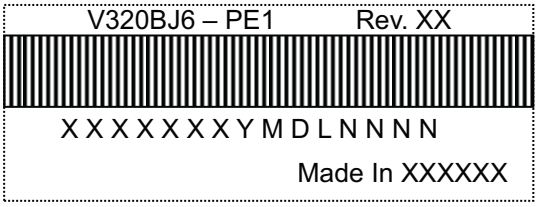
Module is without signal input.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

## 8. DEFINITION OF LABELS

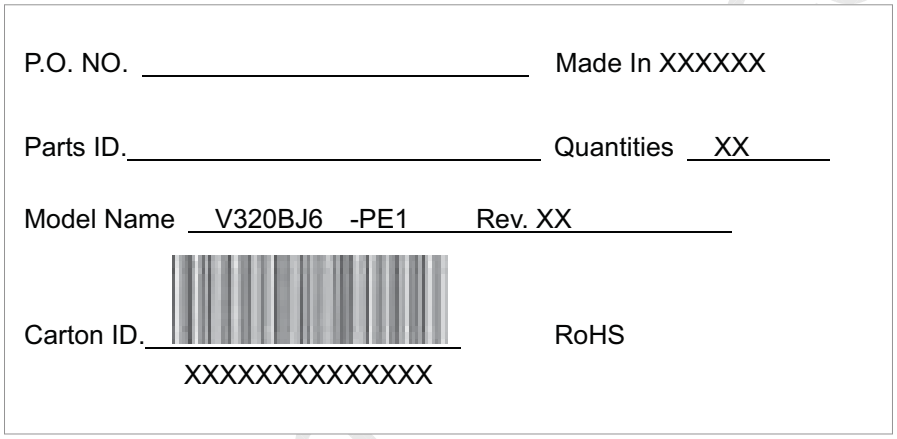
### 8.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMI internal control.




### 8.2 CARTON LABEL

The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation.




(a) Model Name: V320BJ6– PE1

(b) Carton ID: CMI internal control

(c) Quantities: xx

## 9. PACKAGING

### 9.1 PACKAGING SPECIFICATIONS

(1) 10PCS LCD TV Panels / 1 Box

(2) Box dimensions : 810 (L) X 555 (W) X 92 (H) mm

(3) Weight : approximately 16Kg (10 panels per box)

(4) 260 LCD TV Panels / 1 Group

### 9.2 PACKAGING METHOD

Figures 9-1 and 9-2 are the packing method

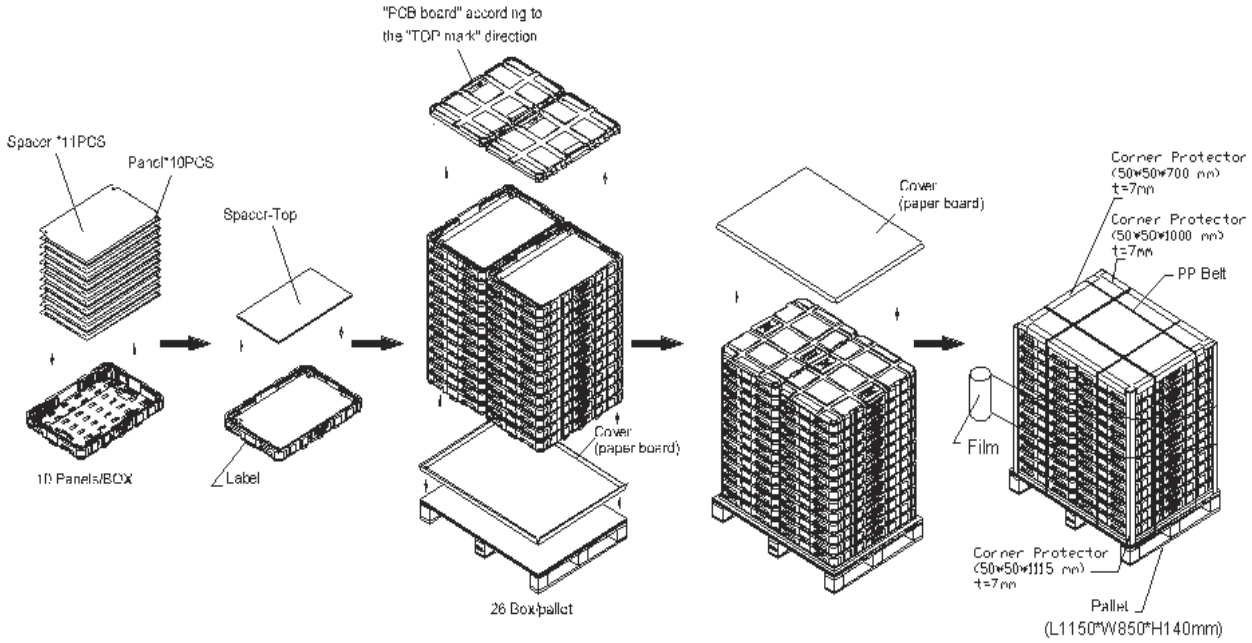



Figure.9-1 packing method

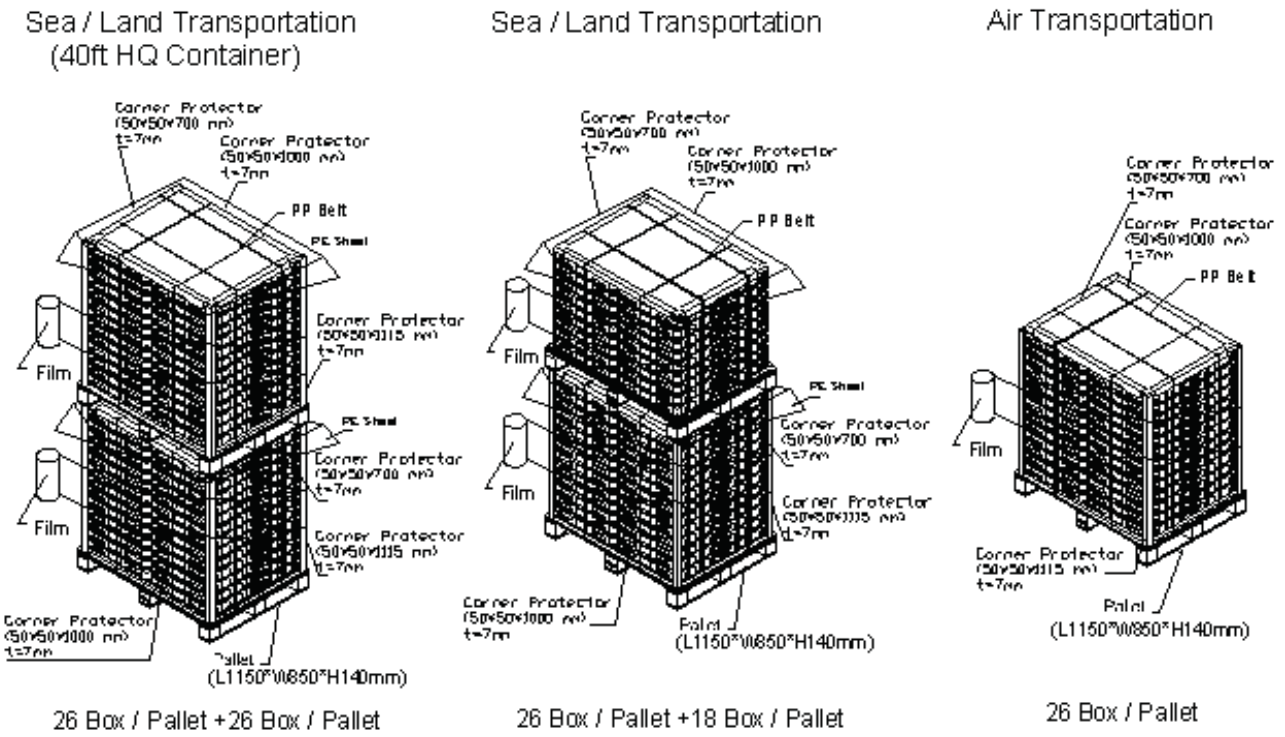



Figure.9-2 packing method

## 10. PRECAUTIONS

### 10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the product during assembly.

(2) To assemble backlight or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel will be damaged.

(4) Always follow the correct power sequence when the product is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.

(8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.

(9) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

### 10.2 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the product's end of life, it is not harmful in case of normal operation and storage.

## 11. MECHANICAL CHARACTERISTIC